

WHAT IS CLAIMED:

1 1. Apparatus for adjustably positioning surgical instrumentation relative to bone,
2 comprising:

- 3 a. a structural member adapted to fasten to bone;
- 4 b. surgical instrumentation adapted to guide surgical devices; and
- 5 c. an alignment module, comprising:
 - 6 i. a structural member retention component adapted to connect to the
 - 7 structural member;
 - 8 ii. a surgical instrumentation retention component adapted to connect
 - 9 to the surgical instrumentation;
 - 10 iii. an intermediate component adapted to connect to the structural
 - 11 member retention component in a fashion that allows the structural member
 - 12 retention component and the intermediate component to rotate relative to each
 - 13 other about at least one axis, and adapted to connect to the surgical
 - 14 instrumentation retention component in a fashion that allows the surgical
 - 15 instrumentation retention component and the intermediate component to rotate
 - 16 relative to each other about at least one axis;
 - 17 iv. an adjustment mechanism connecting the intermediate component
 - 18 and the structural member retention component, the adjustment mechanism
 - 19 adapted to control and fix orientation of the intermediate component relative to
 - 20 the structural member retention component; and
 - 21 v. an adjustment mechanism connecting the intermediate component
 - 22 and the surgical instrumentation retention component, the adjustment mechanism
 - 23 adapted to control and fix orientation of the intermediate component and the
 - 24 surgical instrumentation retention component.

1 2. A process for conducting knee surgery, comprising:

- 2 a. exposing bones in the vicinity of the knee joint;

- 3 b. fastening a rod to bone in the vicinity of the knee joint in a manner
- 4 intended at least coarsely to align the rod to a desired axis relative to the bone;
- 5 c. attaching a rod retention component of an alignment module to the rod,
- 6 the alignment module comprising:
 - 7 i. a rod retention component adapted to connect to the rod;
 - 8 ii. a surgical instrumentation retention component adapted to connect
 - 9 to surgical instrumentation;
 - 10 iii. an intermediate component adapted to connect to the rod retention
 - 11 component in a fashion that allows the rod retention component and intermediate
 - 12 component to rotate relative to each other about at least one axis, and adapted to
 - 13 connect to the surgical instrumentation retention component in a fashion that
 - 14 allows the surgical instrumentation retention component and the intermediate
 - 15 component to rotate relative to each other about at least one axis;
 - 16 iv. an adjustment mechanism connecting the intermediate component
 - 17 and the rod retention component, the adjustment mechanism adapted to control
 - 18 and fix orientation of the intermediate component relative to the rod retention
 - 19 component; and
 - 20 v. an adjustment mechanism connecting the intermediate component
 - 21 and the surgical instrumentation retention component, the adjustment mechanism
 - 22 adapted to control and fix orientation of the intermediate component and the
 - 23 surgical instrumentation retention component;
 - 24 d. attaching instrumentation to the alignment module;
 - 25 e. adjusting at least one of the adjustment mechanisms in order to finely
 - 26 align the instrumentation relative to the bone;
 - 27 f. resecting bone using the instrumentation;
 - 28 g. attaching a surgical implant to the resected bone;
 - 29 h. reassembling the knee; and
 - 30 i. closing the exposed knee.

1 3. A mill guide instrument for guiding a tissue cutting mill, the mill guide instrument
2 comprising:

3 a guide body comprising a distal section adapted to fit into a bore in a bone and a
4 template section having a guide surface; and a mill guide selectively mounted on the
5 guide body and adapted to engage the tissue cutting mill, the mill guide comprising a
6 stylus configured to selectively follow the guide surface of the template such that the mill
7 guide orients the tissue cutting mill towards tissue to be removed from the bone to form a
8 bone cavity.

1 4. A mill guide instrument for cutting a cavity in bone comprising:

2 a guide body comprising a distal section dimensioned to fit into a bore in a bone
3 and a template section having a guide surface;

4 a mill guide being rotationally connected to the guide body, the mill guide
5 comprising a stylus and a sleeve;

6 a mill being slidably received within the sleeve, the mill having a proximal
7 section, distal section and a shaft extending therebetween, the mill being oriented toward
8 tissue to be removed when the stylus selectively follows the guide surface of the template
9 section.

1 5. A method of using a mill guiding instrument for guiding a tissue cutting tool, the method
2 comprising:

3 inserting a guide body into a bore in a bone;

4 attaching a template section with a guide surface to the guide body;

5 attaching a mill guide with a stylus to the guide body;

6 activating the mill with a cutting tip positioned to remove bone tissue; and

7 following the guide surface of the template section with the stylus until the cavity
8 is prepared to accept prosthesis.

1 6. A mill guiding instrument for cutting a cavity in bone, comprising:

2 a support frame having a distal portion adapted to be received within the bone;

3 a mill guide connected to the support frame and having a stylus;
4 a mill adapted to cut tissue and adapted to rotate within the mill guide;
5 a template connected to the support frame and having a guide surface comprised
6 of a three-dimensional surface, tracing the template with the stylus causing the mill guide
7 to position the mill such that a desired cavity is cut into the bone.

1 7. A cutting jig for preparing a bone to receive an implant comprising:

2 a shaft having a portion insertable in a medullary canal of the bone for coupling
3 the cutting jig to the bone;
4 a length adjustment member slidable on the shaft to vary the length adjustment
5 member location with respect to the shaft;
6 an arm extending laterally from the length adjustment member;
7 an extension extending from a lateral end of the arm; and
8 a cutting guide located on an end of the extension.

1 8. An instrument for resecting the distal femur, comprising:

2 a plurality of cutting guide blocks, each of said plurality of cutting guide blocks
3 having an anterior cutting guide surface defining three points, a posterior cutting guide
4 surface defining three points, an anterior chamfer guide surface defining three points, a
5 posterior chamfer guide surface defining three points, and a distal cutting guide surface
6 defining three points;
7 a pair of positioning fixtures, for positioning one of said cutting guide blocks on
8 the distal femur;
9 an alignment assembly for positioning said pair of positioning fixtures;
10 a drill guide cooperating with said alignment assembly for drilling holes in the
11 distal femur for attaching said pair of positioning fixtures to the distal femur; and
12 a sizing boom attachable to said alignment assembly for selecting said one cutting
13 guide block from said plurality of cutting guides, said sizing boom including an
14 adjustable stylus for contacting the most prominent aspect of the anterior lateral cortex to
15 determine the appropriate size for said one cutting guide.

1 9. A method of resecting a bone during arthroplasty using a resection guide, said method
2 comprising:

3 aligning the resection guide relative to the bone in three degrees of freedom, at
4 least one of said degrees of freedom being rotational;

5 locking the resection guide in position; and

6 resecting the bone using the resection guide, wherein said step of aligning
7 includes moving the resection guide through an infinitely adjustable range.

1 10. A method according to claim 9, further comprising anchoring a pin to the bone, and
2 coupling the resection guide to said pin via an alignment guide.

1 11. A method according to claim 10, wherein said locking of the resection guide comprises
2 locking said alignment guide in each of said three degrees of freedom.

1 12. A method according to claim 9, wherein said locking of the resection guide includes
2 pinning said resection guide to the bone.

1 13. A method according to claim 9, wherein said resecting the bone using the resection guide
2 does not require the removal from the bone of any part of the resection guide prior to resection.

1 14. A method of resecting a bone during arthroplasty using a resection guide, said method
2 comprising:

3 aligning the resection guide relative to the bone in three degrees of freedom, at
4 least one of said degrees of freedom being rotational;

5 locking the resection guide in position; and

6 resecting the bone using the resection guide, wherein said method is adapted for
7 resecting both the femur and the tibia.

1 15. A method according to claim 14, further comprising:
2 coupling an EM rod to the resection guide; and

3 using the EM rod to perform the aligning of the resection guide.

1 16. A method of resecting a bone during arthroplasty using a resection guide, said method
2 comprising:

3 aligning the resection guide relative to the bone in three degrees of freedom, at
4 least one of said degrees of freedom being rotational;

5 locking the resection guide in position; and

6 resecting the bone using the resection guide, wherein no part of the resection
7 guide needs to be removed from the bone prior to resection.

1 17. A method according to claim 16, further comprising:

2 coupling an EM rod to the resection guide; and

3 using the EM rod to perform the step of aligning the resection guide.

1 18. A method of locating a resection guide for resecting a bone during arthroplasty, said
2 method comprising:

3 aligning the resection guide relative to the bone in three degrees of freedom, at
4 least one of said degrees of freedom being rotational; and

5 locking the resection guide in position, wherein said aligning includes moving the
6 resection guide through an infinitely adjustable range.

1 19. A method according to claim 18, further comprising:

2 coupling an EM rod to the resection guide; and

3 using the EM rod to perform the aligning of the resection guide.

1 20. A method according to claim 18, wherein said resection guide does not need to be
2 removed from any part of the bone prior to resection.

1 21. A method according to claim 18, wherein said method is adapted for resecting both the
2 femur and the tibia.

1 22. A method according to claim 18, wherein said resection guide does not need to be
2 removed from any part of the bone prior to resection and said method is adapted for resecting
3 both the femur and the tibia.

1 23. A method of locating a resection guide for resecting a bone during arthroplasty, said
2 method comprising:

3 aligning the resection guide relative to the bone in three degrees of freedom, at
4 least one of said degrees of freedom being rotational; and

5 locking the resection guide in position, wherein said method is adapted for
6 resecting both the femur and the tibia.

1 24. A method according to claim 23, further comprising:

2 coupling an EM rod to the resection guide; and

3 using the EM rod to perform the aligning of the resection guide.

1 25. A method of locating a resection guide for resecting a bone during arthroplasty, said
2 method comprising:

3 aligning the resection guide relative to the bone in three degrees of freedom, at
4 least one of said degrees of freedom being rotational; and

5 locking the resection guide in position, wherein no part of the resection guide
6 needs to be removed from the bone prior to resection.

1 26. A method according to claim 25, further comprising:

2 coupling an EM rod to the resection guide; and

3 using the EM rod to perform the aligning of the resection guide.

1 27. A method for aligning a resection guide relative to a patient's bone during arthroplasty,
2 said method comprising:

3 coupling an alignment guide to a patient's bone;

4 coupling a resection guide to said alignment guide; and

5 positioning said resection guide along a translational path and along a plurality of
6 rotational paths by manipulating said alignment guide.

1 28. A method according to claim 27, wherein said plurality of rotational paths comprise a
2 first rotational path and a second rotational path.

1 29. A method according to claim 28, wherein said first and second rotational paths are about
2 different axes.

1 30. A method according to claim 29, wherein said axes are transverse to each other.

1 31. A method according to claim 27, further including attaching an anchoring pin to a
2 patient's bone and securing said alignment guide thereto.

1 32. A method according to claim 27, further including locking said alignment guide along
2 said translational path and about a first and second one of said plurality of rotational paths.

1 33. A method for aligning a resection guide relative to a patient's bone during arthroplasty,
2 said method comprising:

3 coupling an alignment guide to a patient's bone;
4 coupling a resection guide to said alignment guide; and
5 aligning said resection guide relative to the bone in three degrees of freedom by
6 manipulation of the alignment guide, at least one of said degrees of freedom being
7 rotational.

1 34. Instrumentation for intramedullary alignment for femoral instruments in minimally
2 invasive unicompartamental knee replacement surgery, said instrumentation comprising:

3 an intramedullary rod for insertion in the intramedullary canal of a femur;
4 a resection block for fixation to the femur with the knee in flexion, said resection
5 block having a planar slot for receiving a cutting member to establish a planar surface

6 along a posterior aspect of a femoral condyle of the femur and a channel extending
7 through said resection block in a medial-lateral direction parallel to said slot; and

8 a linking instrument comprising a vertical linking bar and a horizontal linking bar
9 extending from said vertical linking bar at an angle, said horizontal linking bar being
10 receivable in said channel to couple said linking instrument to said resection block to
11 form a one-piece construct, said vertical linking bar being mountable to said
12 intramedullary rod in a perpendicular orientation thereto couple said construct to said
13 intramedullary rod.